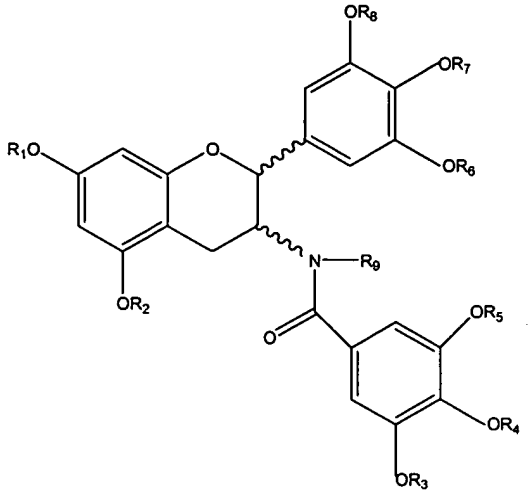
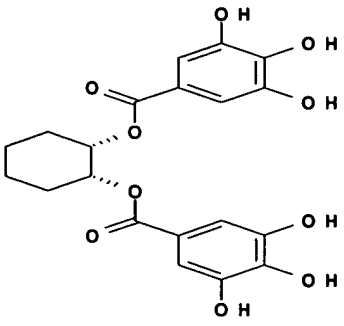
Claims

We claim:

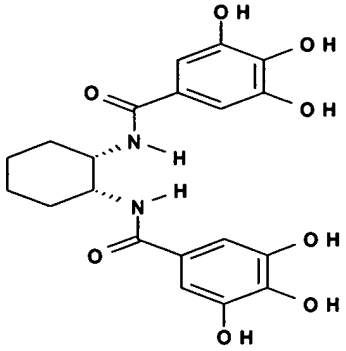
1. A compound having a formula selected from the group consisting of:



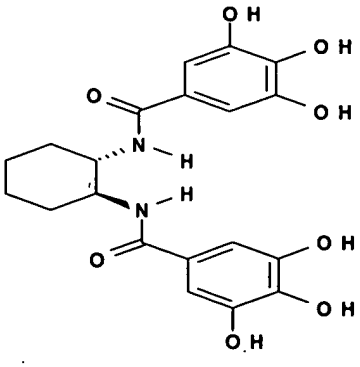
(I);



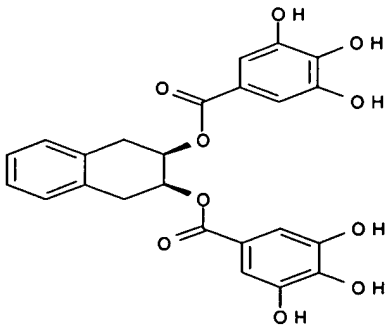
GTP-1;



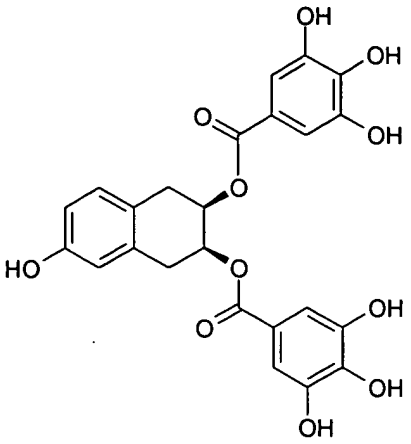
GTP-2;



GTP-3;



GTP-4; and



GTP-5;

wherein R_1-R_9 are independently selected from the group consisting of -H, alkyl, alkenyl, cycloalkyl, heterocycloalkyl, cycloalkenyl, heterocycloalkenyl, aryl, and acyl.

2. The compound according to claim 1, wherein said compound is (-)-EGCG-amide or (+)-EGCG-amide.

3. A composition comprising at least one compound of claim 1, or a pharmaceutically acceptable salt or analog thereof; and a pharmaceutically acceptable carrier or diluent.

4. The composition according to claim 3, further comprising an agent selected from the group consisting of an antioxidant, free radical scavenging agent, peptide, growth factor, antibiotic, bacteriostatic agent, immunosuppressive, anticoagulant, buffering agent, anti-inflammatory agent, anti-pyretic, time-release binder, anesthetic, steroid, and corticosteroid, or a mixture of two or more of the foregoing.

5. The composition according to claim 3, wherein said compound is (-)-EGCG-amide or (+)-EGCG-amide, or a pharmaceutically acceptable salt or analog thereof.

6. The composition according to claim 3, wherein said compound has less than 100% optical purity.

7. The composition according to claim 3, wherein said compound is optically pure.

8. A method for inhibiting proteasomal activity in cells comprising:

a) contacting the cells with an effective amount of at least one compound of claim 1, or a pharmaceutically acceptable salt or analog thereof; and

b) verifying that proteasomal activity has been inhibited.

9. The method according to claim 8, wherein said compound is (+)-EGCG-amide or (-)-EGCG-amide, or a pharmaceutically acceptable salt or analog thereof.

10. The method according to claim 8, wherein said contacting occurs *in vivo*, and said contacting comprises administering the compound to a patient by a route selected from the group consisting of orally, parenterally, subcutaneously, intravenously, intramuscularly, intraperitoneally, intraarterially, transdermally, and via a mucus membrane.

11. The method according to claim 8, wherein said contacting occurs *in vitro*.

12. The method according to claim 8, wherein said compound has less than 100% optical purity.

13. The method according to claim 8, wherein said compound is optically pure.

14. The method according to claim 8, wherein said proteasome is a 20S proteasome or 26S proteasome.

15. A method for treating cancer comprising administering an effective amount of a composition of claim 3 to a patient.

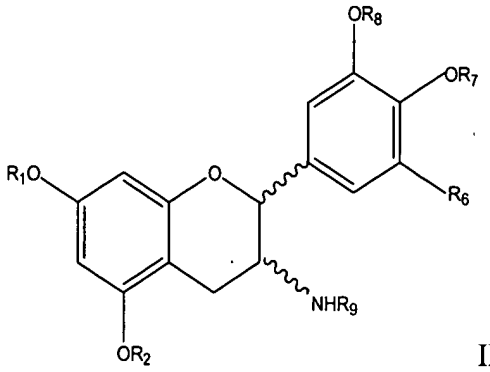
16. The method according to claim 15, wherein said cancer is selected from the group consisting of prostate cancer, leukemia, hormone dependent cancers, breast cancer, colon cancer, lung cancer, epidermal cancer, liver cancer, esophageal cancer, stomach cancer, cancer of the brain, and cancer of the kidney.

17. The method according to claim 15, wherein said administering is conducted by a route selected from the group consisting of orally, parenterally, subcutaneously, intravenously, intramuscularly, intraperitoneally, intraarterially, transdermally, and via a mucus membrane.

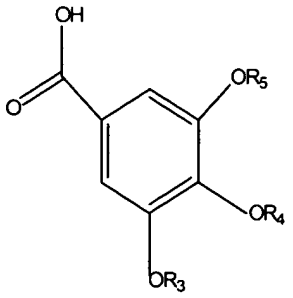
18. The method according to claim 15, wherein said pharmaceutical composition comprises (-)-EGCG-amide; or (+)-EGCG-amide; or a pharmaceutically acceptable salt or analog thereof; or a mixture thereof.

19. A method for synthesizing phenols, said method comprising:

a) coupling a compound represented by formula II with an acid represented by formula III:



II



III

to form a fully protected gallate ester, wherein R_1-R_9 are independently selected from the group consisting of –H, alkyl, acyl, alkenyl, cycloalkyl, heterocycloalkyl, cycloalkenyl, heterocycloalkyl, and aryl.

20. The method according to claim 19, wherein the acid of structure III is employed in the form of a derivative which is an acyl halide or a mixed or symmetric acid anhydride; or the acid of formula III is reacted with the compound of formula II in the presence of a condensing reagent.

21. The method according to claim 20, wherein the derivative is an acyl halide.

22. The method according to claim 21, wherein the acyl halide is selected from the group consisting of acyl chloride, acyl bromide, and acyl iodide.

23. The method according to claim 19, wherein said coupling is carried out in the presence of a base in an inert solvent.

24. The method according to claim 23, wherein the base is selected from the group consisting of dimethylaminopyridine, pyridine, triethylamine, and diisopropylethylamine.

25. The method according to claim 23, wherein the solvent is selected from the group consisting of dichloromethane, ether, and tetrahydrofuran.

26. The method according to claim 23, wherein the acid of formula III is reacted with the compound of formula II in the presence of a condensing agent, wherein the condensing agent is selected from the group consisting of 1,3-diisopropylcarbodiimide; 1,3-dimethylaminopropyl(3-ethyl)carbodiimide; dialkyl carbodiimide; 2-halo-1-alkyl-pyridinium halides; propane phosphonic acid cyclic anhydride; N-ethoxycarbonyl-2-ethoxy-1,2,dihydroquinoline; and dicyclohexylcarbodiimine.

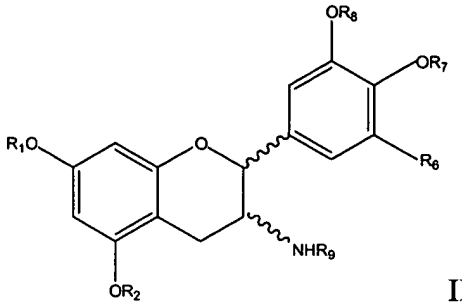
27. The method according to claim 23, further comprising:

b) deprotecting the gallate ester, wherein said deprotecting is selective or non-selective.

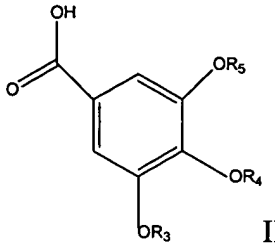
28. The method according to claim 27, wherein said deprotecting is performed with $Pd(OH)_2$ and H_2.

29. A compound produced from a method comprising:

a) coupling a compound of formula II with an acid of formula III:



II

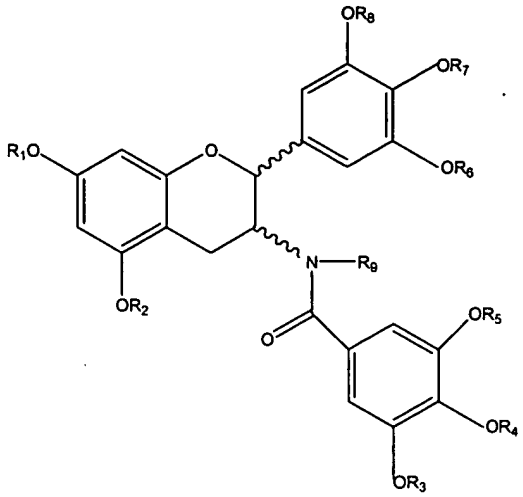


III

to form a fully protected gallate ester wherein R_1-R_9 are independently selected from the group consisting of -H, alkyl, acyl, cyclcoalkyl, heterocycloalkyl, cycloalkenyl, heterocycloalkenyl, and aryl; wherein said coupling is carried out in the presence of a base in an inert solvent; and

b) deprotecting the gallate ester, wherein said deprotecting is selective or non-selective.

30. A method of increasing the relative proportion of cells occupying the G_1 phase of the mitotic cell cycle within a plurality of cells, said method comprising contacting the plurality of cells with an effective amount of a compound having a formula selected from the group consisting of:



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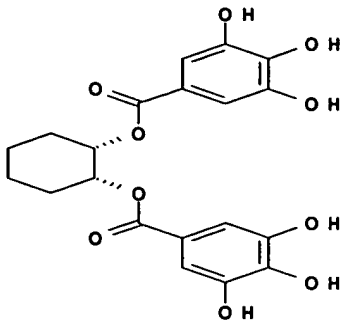

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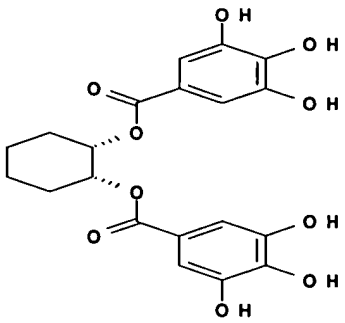

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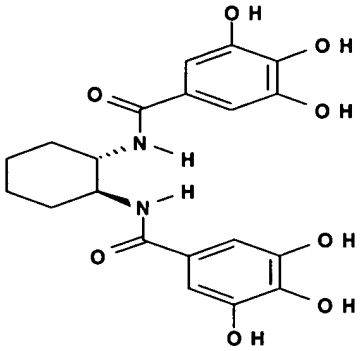

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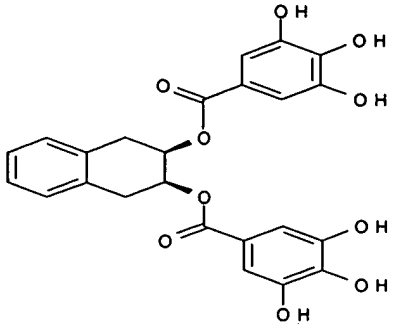
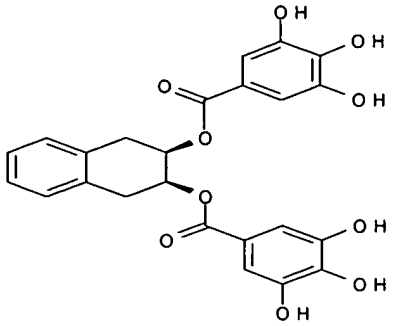


GTP-4; and



GTP-5.

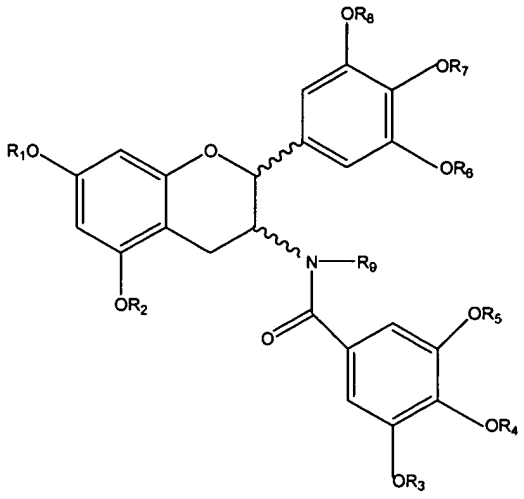
wherein R_1-R_9 are independently selected from the group consisting of -H, alkyl, alkenyl, cycloalkyl, heterocycloalkyl, cycloalkenyl, heterocycloalkenyl, aryl, and acyl.

31. The method according to claim 30, wherein said plurality of cells comprises cancer cells.

32. The method according to claim 30, wherein said contacting is conducted *in vivo*.

33. The method according to claim 30, wherein said contacting is conducted *in vitro*.

34. A method for inducing apoptosis in cells, said method comprising contacting the cells with an effective amount of a compound having a formula selected from the group consisting of:



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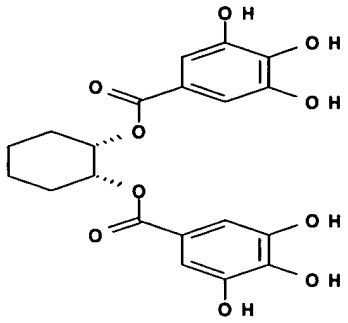

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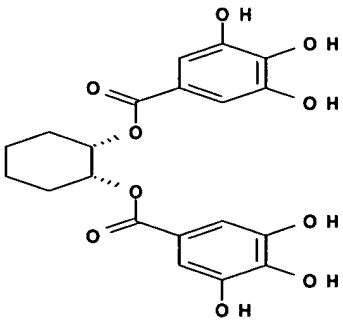

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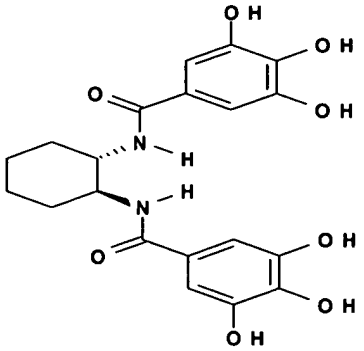
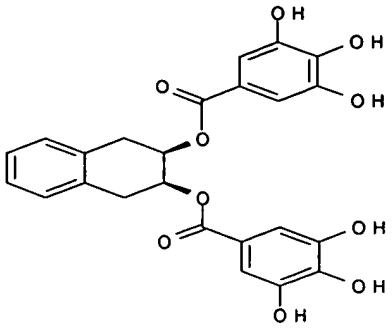
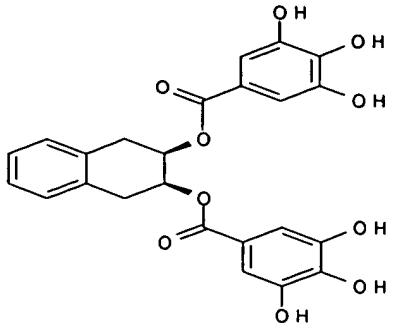


GTP-3;



GTP-4; and



GTP-5.

wherein R_1-R_9 are independently selected from the group consisting of -H, alkyl, alkenyl, cycloalkyl, heterocycloalkyl, cycloalkenyl, heterocycloalkenyl, aryl, and acyl.

35. The method according to claim 34, wherein the cells comprise cancer cells.